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**Listing of the Claims:**

In The Claims:

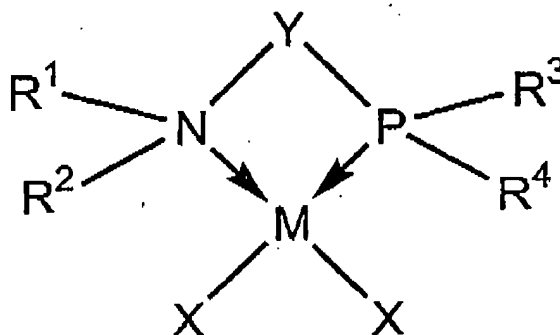
Please amend the claims as follows.

1. (currently amended) A catalyst system comprising the reaction product of:
  - (a) an activator; and
  - (b) a catalyst precursor comprising:
    - (i) a Group-8, -9, or -10 transition metal, M;
    - (ii) an ancillary ligand comprising:
      - a terminal amine comprising two independently selected hydrocarbyl radicals, R<sup>1</sup> and R<sup>2</sup>
      - a terminal phosphine comprising two independently selected hydrocarbyl radicals, R<sup>3</sup> and R<sup>4</sup> and
      - a hydrocarbyl bridge, Y, comprising a backbone wherein the hydrocarbyl bridge connects between the terminal amine and the terminal phosphine and wherein the backbone comprises a chain that is four or more carbon atoms long; and
    - (iii) an abstractable ligand, X<sub>1</sub>

wherein the activator is an alumoxane, an aluminum alkyl, an alkyl aluminum halide, an alkylaluminum alkoxide, a discrete ionic activator, or a Lewis acid.
2. (original) The catalyst system of Claim 1 wherein the catalyst precursor has the following formula:

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wherein

- (i) M is a Group-8, -9, or -10 transition metal;
  - (ii) N is nitrogen;
  - (iii) P is phosphorus;
  - (iv)  $R^1$ ,  $R^2$ ,  $R^3$ , and  $R^4$  are independently hydrocarbyl radicals;
  - (v) Y is a hydrocarbyl bridge comprising a backbone wherein the backbone comprises a chain that is four or more carbon atoms long;
  - (vi) X are independently abstractable ligands.
3. (original) A catalyst system comprising the reaction product of
    - (a) the catalyst system of Claim 2 and
    - (b) ethylene, propylene, 1-butene, or a mixture of any two or all three of ethylene, propylene, and 1-butene.
  4. (original) The catalyst system of Claim 2 further comprising at least one additional olefin polymerization catalyst.
  5. (currently amended) The catalyst system of Claim 2 wherein  $R^1$ ,  $R^2$ ,  $R^3$ , and  $R^4$  are independently selected from  $C_1$ - $C_{40}$  hydrocarbyls.

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6. (currently amended) The catalyst system of Claim 5 wherein  $R^1$ ,  $R^2$ ,  $R^3$ , and  $R^4$  are independently selected from  $C_1$ - $C_{30}$  hydrocarbyls.
7. (currently amended) The catalyst system of Claim 6 wherein  $R^1$ ,  $R^2$ ,  $R^3$ , and  $R^4$  are independently selected from methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, ethenyl, propenyl, butenyl, pentenyl, hexenyl, heptenyl, octenyl, nonenyl, decenyl, undecenyl, dodecenyl, ethynyl, propynyl, butynyl, pentynyl, hexynyl, heptynyl, octynyl, nonynyl, decynyl, undecynyl, dodecynyl, phenyl, benzyl, phenethyl, tolyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclononyl, cyclodecyl, or cyclododecyl radicals.
8. (currently amended) The catalyst system of Claim 7 wherein  $R^1$ ,  $R^2$ ,  $R^3$ , and  $R^4$  are independently selected from methyl, ethyl, propyl, butyl, cyclohexyl, phenyl, tolyl, benzyl, and or phenethyl.
9. (currently amended) The catalyst system of Claim 2 wherein X are independently hydride radicals; hydrocarbyl radicals; ~~hydrocarbyl-substituted~~, hydrocarbyl-substituted; or organometalloid radicals.
10. (currently amended) The catalyst system of Claim 9 wherein two X's are connected to each other to form a 3-to-50-atom metallacycle ring.
11. (original) The catalyst system of Claim 2 wherein X are independently halogen, alkoxide, aryloxy, amide, or phosphide radicals.
12. (currently amended) The catalyst system of Claim 11 wherein X are independently chloride, bromide, iodide, methoxide, ethoxide,

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dimethylamide, diethylethoxide, or phenoxide.

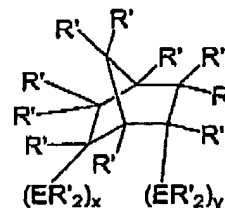
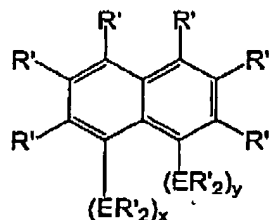
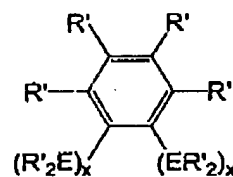
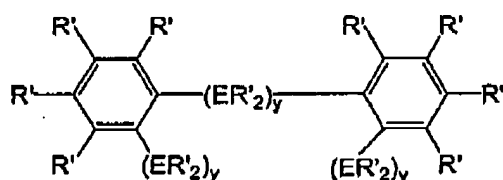
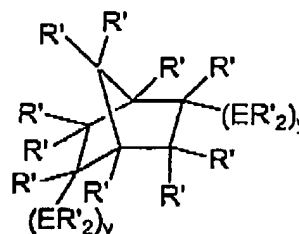
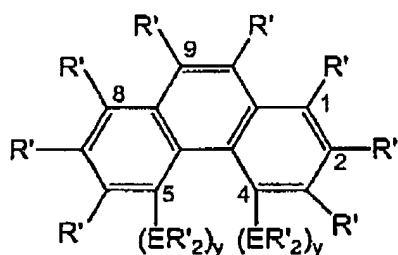
13. (currently amended) The catalyst system of Claim 9 wherein X are independently selected from the group consisting of methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, hydride, phenyl, benzyl, phenethyl, tolyl, methoxy, ethoxy, propoxy, butoxy, dimethylamino, diethylamino, ~~methylethylamine,~~ and methylethylamino.
14. (original) The catalyst system of Claim 2 wherein X are independently acetylacetonate, 1,1, 1,5,5,5-hexa-fluoroacetylacetonate, 1,1,1-trifluoroacetylacetonate, or 1,1, 1-trifluoro-5,5-di-methylacetylacetonate radicals.
15. (currently amended) The catalyst system of Claim 2 wherein M is selected from the group consisting of nickel, iron, cobalt, palladium, platinum, ruthenium, osmium, rhodium, and iridium.
16. (currently amended) The catalyst system Claim 15 wherein M is selected from the group consisting of iron, nickel, cobalt, and palladium.
17. (currently amended) The catalyst system of Claim 15 wherein Y is selected from the group consisting of butylene, pentylene, hexylene, heptylene, octylene, nonylene, decylene, undecylene, dodecylene, tridecylene, tetradecylene, pentadecylene, hexadecylene, heptadecylene, octadecylene, nonadecylene, eicosylene, heneicosylene, docosylene, tricosylene, tetracosylene, pentacosylene, hexacosylene, heptacosylene, octacosylene, nonacosylene, triacontylene, cyclohexylene, cyclooctylene, cyclododecylene, cyclododecylene, biphenyl, butenylene, penentylene, hexenyene, heptenylene, octenylene, nonenylene, decenylene,

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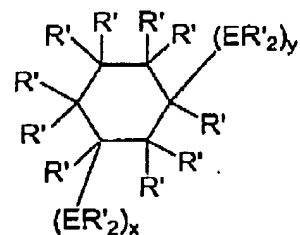
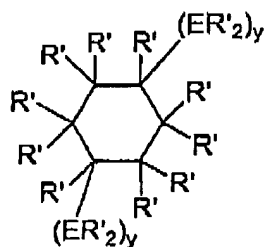
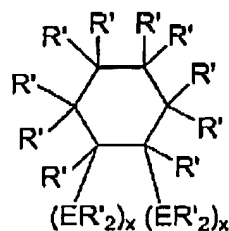
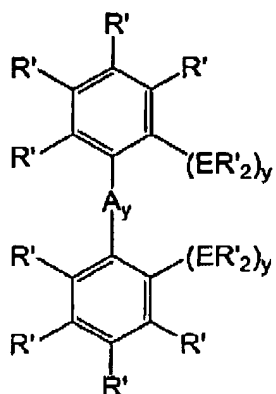
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undecenylene, dodecenylene, hexynylene, heptynylene, octynylene, nonynylene, decynylene, undecynylene, dodecynylene, butadienylene, pentadienylene, hexadienylene, heptadienylene, octadienylene, nonadienylene, decadienylene, undecadienylene, dodecadienylene, hexatrienylene, octatrienylene, decatrienylene, and dodecatrienylene radicals.

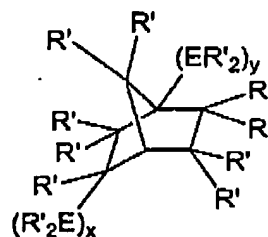
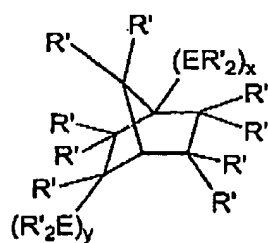
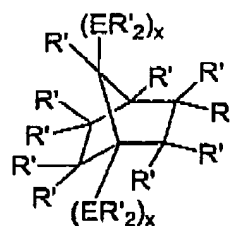
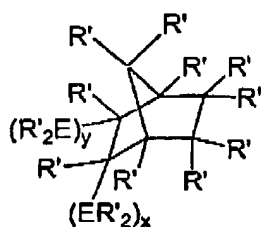
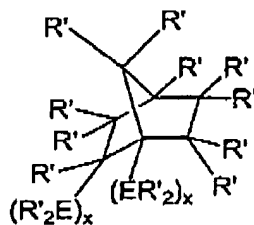
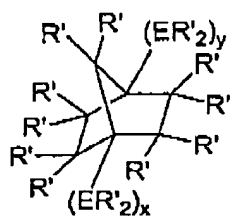
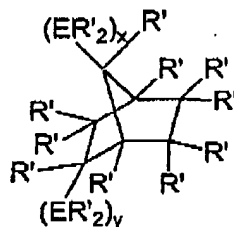
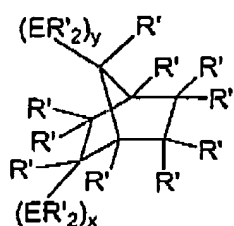
18. (currently amended) The catalyst system of claim 17 wherein Y is ~~selected from~~ biphenyl.
19. (currently amended) The catalyst ~~system of 17~~ system of claim 2 wherein Y has one of the following formulas:



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where

- (a)  $R'$  are independently[,] hydrogen or  $C_1$ - $C_{50}$  hydrocarbyl radicals;
- (b) A is a non-hydrocarbon atom functional group;
- (c) E is a Group-14 element;

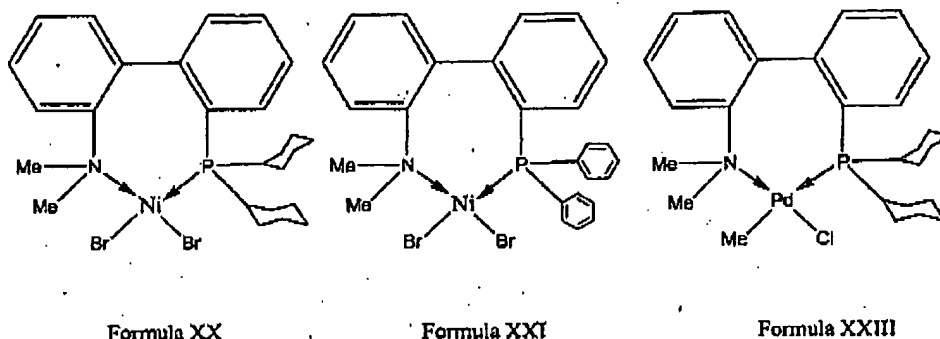
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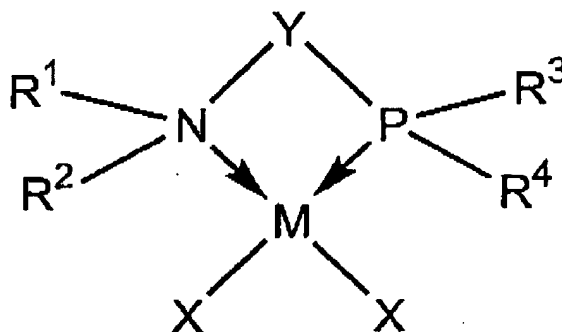
- (d) x is an integer from 1 to 4; and
  - (e) y is an integer from 0 to 4.
20. (currently amended) The catalyst system of Claim 19 wherein A is selected from the group consisting of C=O, C=S, O, S, SO<sub>2</sub>, NR\*, PR\*, BR\*, SiR\*<sub>2</sub>, and GeR\*<sub>2</sub>, where R\* is independently a hydrocarbyl or halocarbyl radical.
21. (withdrawn) A polymerization method comprising the step of providing at least one catalyst system of Claim 2.
22. (withdrawn) The polymerization method of Claim 21 wherein the catalyst's activity exceeds 8000 moles of ethylene per mole transition metal per hour.
23. (withdrawn) The polymerization method of Claim 22 further comprising recovering a product comprising greater than 50 mol% of linear C4-C14 a-olefins based on the total weight of polymerized product.
24. (withdrawn) The polymerization method of 23 wherein the product comprises greater than 80 mol% of linear C4-C14 a-olefins.
25. (withdrawn) The polymerization method of 24 wherein the product comprises greater than 50 mol% of linear C4 and C6 a-olefins.
26. (withdrawn) The polymerization method of 25 wherein the product comprises greater than 80 mol% of linear C4 and C6 a-olefins.
27. (withdrawn) A catalyst precursor with one of the following formula:



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28. (currently amended) A catalyst system comprising the reaction product of:
- an activator; and
  - a catalyst precursor with the following formula:



wherein

- M is iron, nickel, cobalt, and palladium;
- N is nitrogen;
- P is phosphorus;
- $R^1$ ,  $R^2$ ,  $R^3$ , and  $R^4$  are independently selected from the group consisting of methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl,

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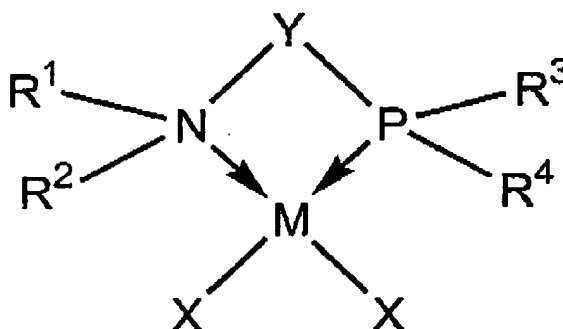
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heptacosyl, octacosyl, nonacosyl, triacontyl, ethenyl, propenyl, butenyl, pentenyl, hexenyl, heptenyl, octenyl, nonenyl, decenyl, undecenyl, dodecenyl, ethynyl, propynyl, butynyl, pentynyl, hexynyl, heptynyl, octynyl, nonynyl, decynyl, undecynyl, dodecynyl, phenyl, benzyl, phenethyl, tolyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclononyl, cyclodecyl, and cyclododecyl radicals;

- (v) Y is a hydrocarbonyl bridge comprising a backbone wherein the backbone comprises a chain that is four or more carbon atoms long; and
- (vi) X are independently abstractable ligands,  
wherein the activator is an alumoxane, an aluminum alkyl, an alkyl aluminum halide, an alkylaluminum alkoxide, a discrete ionic activator, or a Lewis acid.

29. (currently amended) A catalyst system comprising the reaction product of:

- (a) an activator; and
- (b) a catalyst precursor with the following formula:



wherein

- (i) M is ~~from~~ nickel, iron, cobalt, palladium, platinum, ruthenium, osmium, rhodium, ~~and iridium~~ or iridium;

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- (ii) N is nitrogen;
- (iii) P is phosphorus;
- (iv)  $R^1$ ,  $R^2$ ,  $R^3$ , and  $R^4$  are independently selected from the group consisting of methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, ethenyl, propenyl, butenyl, pentenyl, hexenyl, heptenyl, octenyl, nonenyl, decenyl, undecenyl, dodecenyl, ethynyl, propynyl, butynyl, pentynyl, hexynyl, heptynyl, octynyl, nonynyl, decynyl, undecynyl, dodecynyl, phenyl, benzyl, phenethyl, tolyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclononyl, cyclodecyl, and cyclododecyl radicals;
- (v) Y is a hydrocarbyl bridge comprising a backbone wherein the backbone comprises a chain that is four or more carbon atoms long; and
- (vi) X are independently chloride, bromide, iodide, methoxide, ethoxide, dimethylamide, diethylethoxide, phenoxide, methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, hydride, phenyl, benzyl, phenethyl, tolyl, methoxy, ethoxy, propoxy, butoxy, dimethylamino, diethylamino, methylethylamino, acetylacetate, 1,1, 1,5,5,5-hexa-fluoroacetylacetate, 1,1, 1-trifluoro-acetylacetate, or 1,1, 1-trifluoro-5,5-di-methylacetylacetate radicals; or two X's are connected to form a 3-to-40-atom metallacycle ring,  
wherein the activator is an alumoxane, an aluminum alkyl, an alkyl aluminum halide, an alkylaluminum alkoxide, a discrete ionic

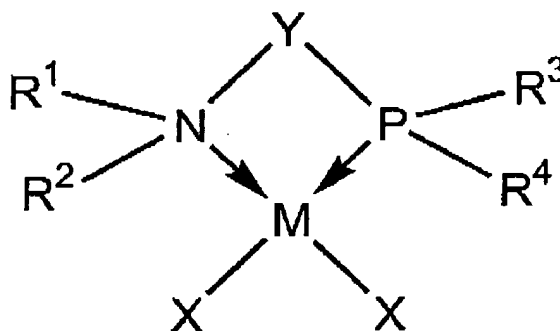
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activator, or a Lewis acid.

30. (currently amended) A catalyst system comprising the reaction product of:

- (a) an activator; and
- (b) a catalyst precursor with the following formula:



wherein

- (i) M is ~~selected from~~ nickel, iron, cobalt, palladium, platinum, ruthenium, osmium, rhodium, ~~and iridium~~ or iridium;
- (ii) N is nitrogen;
- (iii) P is phosphorus;
- (iv) R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, and R<sup>4</sup> are independently selected from the group consisting of methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, ethenyl, propenyl, butenyl, pentenyl, hexenyl, heptenyl, octenyl, nonenyl, decenyl, undecenyl, dodecenyl, ethynyl, propynyl, butynyl, pentynyl, hexynyl, heptynyl, octynyl, nonynyl, decynyl, undecynyl, dodecynyl, phenyl, benzyl, phenethyl, tolyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclononyl,

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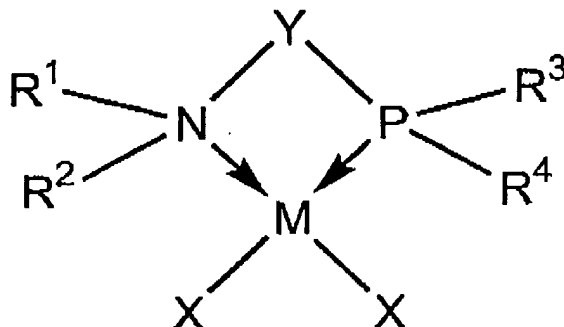
- cyclodecyl, or cyclododecyl radicals;
- (v) Y is ~~selected from~~ butylene, pentylene, hexylene, heptylene, octylene, nonylene, decylene, undecylene, dodecylene, tridecylene, tetradecylene, pentadecylene, hexadecylene, heptadecylene, octadecylene, nonadecylene, eicosylene, heneicosylene, docosylene, tricosylene, tetracosylene, pentacosylene, hexacosylene, heptacosylene, octacosylene, nonacosylene, triacontylene, cyclohexylene, cyclooctylene, cyclodecylene, cyclododecylene, biphenyl, butenylene, penentylene, hexenylene, heptenylene, octenylene, nonenylene, decenylene, undecenylene, dodecenylene, hexynylene, heptynylene, octynylene, nonynylene, decynylene, undecynylene, dodecynylene, butadienylene, pentadienylene, hexadienylene, heptadienylene, octadienylene, nonadienylene, decadienylene, undecadienylene, dodecadienylene, hexatrienylene, octatrienylene, decatrienylene, and dodecatrienylene radicals or dodecatrienylene radicals; and
- (vi) X are independently chloride, bromide, iodide, methoxide, ethoxide, dimethylamide, diethylethoxide, phenoxide, methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, hydride, phenyl, benzyl, phenethyl, tolyl, methoxy, ethoxy, propoxy, butoxy, dimethylamino, diethylamino, methylethylamino, acetylacetonate, 1,1, 1,5,5,5-hexa-fluoroacetylacetonate, 1,1, 1-trifluoro-acetylacetonate, or 1,1, 1-trifluoro-5,5-di-methylacetylacetonate radicals; or two X's are connected to each other to form a 3-to-40-atom metallacycle ring, wherein the activator is an alumoxane, an aluminum alkyl, an alkyl aluminum halide, an alkylaluminum alkoxide, a discrete ionic activator, or a Lewis acid.

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31. (currently amended) A catalyst system comprising the reaction product of:

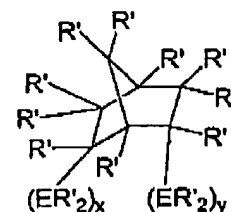
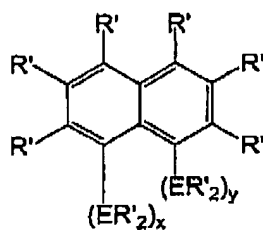
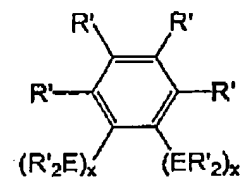
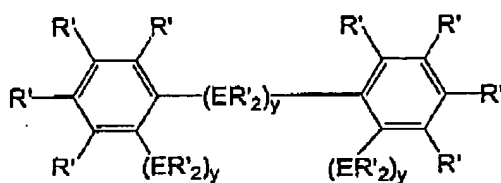
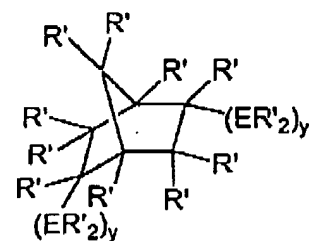
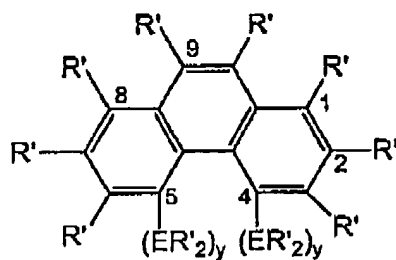
- (a) an activator; and
- (b) a catalyst precursor with the following formula:



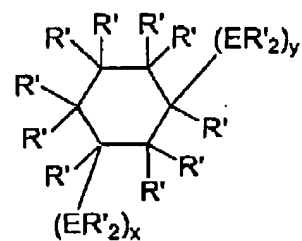
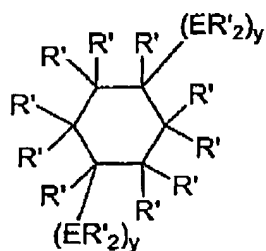
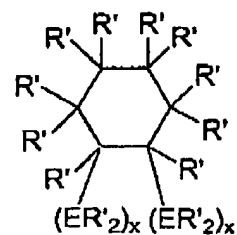
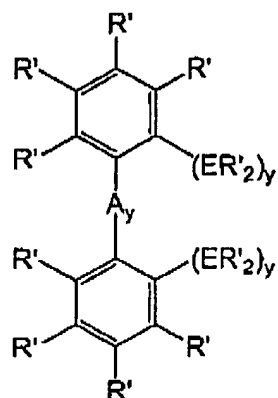
wherein

- (i)  $M$  is a Group-8, -9, or -10 transition metal;
- (ii)  $N$  is nitrogen;
- (iii)  $P$  is phosphorus;
- (iv)  $R^1$ ,  $R^2$ ,  $R^3$ , and  $R^4$   ~~$R^1$ ,  $R^2$ ,  $R^3$ , and  $R^4$~~  are independently hydrocarbyl radicals;
- (v)  $Y$  is represented by one of the following formulas:

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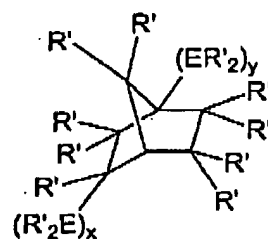
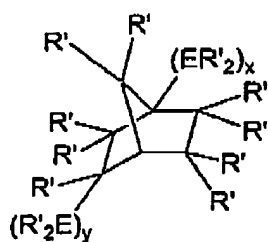
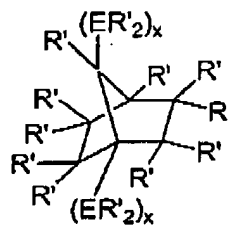
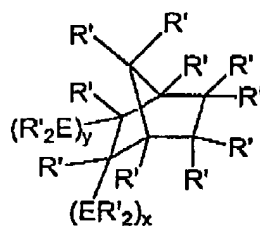
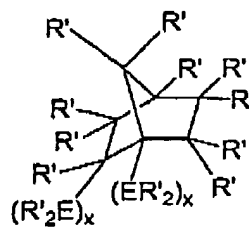
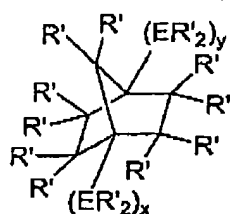
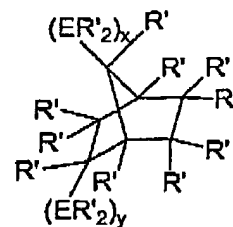
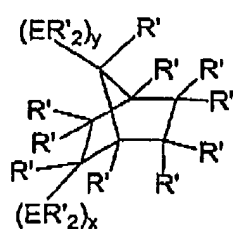


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where

- $R'$  are independently, hydrogen or  $C_1$ - $C_{50}$  hydrocarbyl radicals;
- $A$  is a non-hydrocarbon atom functional group;
- $E$  is a Group-14 element;

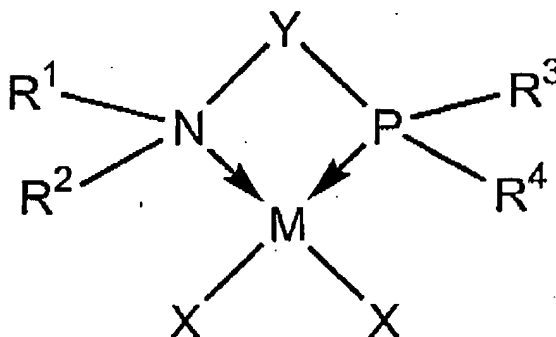
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- x is an integer from 1 to 4; and
  - y is an integer from 0 to 4.
- (vi) X are independently chloride, bromide, iodide, methoxide, ethoxide, dimethylamide, diethylethoxide, phenoxide, methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, hydride, phenyl, benzyl, phenethyl, tolyl, methoxy, ethoxy, propoxy, butoxy, dimethylamino, diethylamino, methylethylamino, acetylacetonate, 1,1, 1,5,5,5-hexa-fluoroacetylacetonate, 1,1, 1-trifluoro-acetylacetonate, or 1,1,1-trifluoro-5,5-di-methylacetylacetonate radicals; or two X's are connected to each other to form a 3-to-40-atom metallacycle ring, wherein the activator is an alumoxane, an aluminum alkyl, an alkyl aluminum halide, an alkylaluminum alkoxide, a discrete ionic activator, or a Lewis acid.

32. (withdrawn) A polymerization method wherein the catalysts activity exceeds 8000 moles of ethylene per mole transition metal per hour comprising the step of providing at least one catalyst system comprising the reaction product of:
- (a) an activator; and
  - (b) a catalyst precursor with the following formula:

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wherein

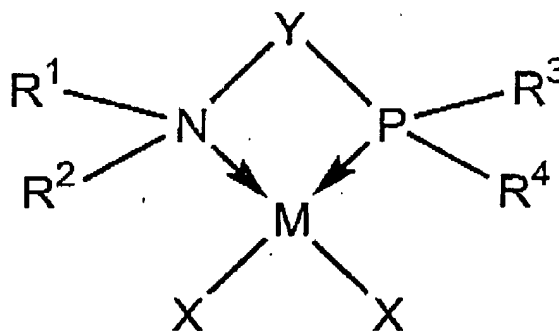
- (i) M is iron, nickel, cobalt, and palladium;
- (ii) N is nitrogen;
- (iii) P is phosphorus;
- (iv)  $R^1$ ,  $R^2$ ,  $R^3$ , and  $R^4$  are independently selected from methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, ethenyl, propenyl, butenyl, pentenyl, hexenyl, heptenyl, octenyl, nonenyl, decenyl, undecenyl, dodecenyl, ethynyl, propynyl, butynyl, pentynyl, hexynyl, heptynyl, octynyl, nonynyl, decynyl, undecynyl, dodecynyl, phenyl, benzyl, phenethyl, tolyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclononyl, cyclodecyl, cyclododecyl radicals;
- (v) Y is a hydrocarbyl bridge comprising a backbone wherein the backbone comprises a chain that is four or more carbon atoms long;
- (vi) X are independently abstractable ligands.

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33. (withdrawn) A polymerization method wherein the catalysts activity exceeds 8000 moles of ethylene per mole transition metal per hour comprising the step of providing at least one catalyst system comprising the reaction product of:

- (a) an activator; and  
(b) a catalyst precursor with the following formula:



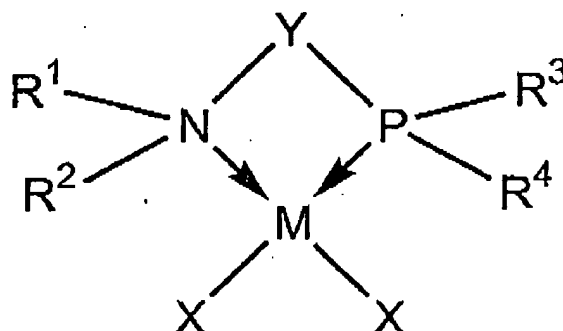
wherein

- (i) M is iron, nickel, cobalt, and palladium, platinum, ruthenium, osmium, rhodium, and iridium;  
(ii) N is nitrogen;  
(iii) P is phosphorus;  
(iv) R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, and R<sup>4</sup> are independently selected from methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, ethenyl, propenyl, butenyl, pentenyl, hexenyl, heptenyl, octenyl, nonenyl, decenyl, undecenyl, dodecenyl, ethynyl, propynyl, butynyl, pentynyl, hexynyl, heptynyl, octynyl, nonynyl, decynyl, undecynyl, dodecynyl, phenyl, benzyl, phenethyl, tolyl, cyclobutyl, cyclopentyl,

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- cyclohexyl, cycloheptyl, cyclooctyl, cyclononyl, cyclodecyl, cyclododecyl radicals;
- (v) Y is a hydrocarbyl bridge comprising a backbone wherein the backbone comprises a chain that is four or more carbon atoms long; and
- (vi) X are independently chloride, bromide, iodide, methoxide, ethoxide, dimethylamide, diethylethoxide, phenoxide, methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, hydride, phenyl, benzyl, phenethyl, tolyl, methoxy, ethoxy, propoxy, butoxy, dimethylamino, diethylamino, methylethylamino, acetylacetonate, 1,1, 1,5,5,5-hexa-fluoroacetylacetonate, 1,1, 1-trifluoro-acetylacetonate, or 1,1, 1-trifluoro-5,5-di-methylacetylacetonate radicals; or two X's are connected to form a 3-to-40-atom metallacycle ring.
34. (withdrawn) A polymerization method wherein the catalysts activity exceeds 8000 moles of ethylene per mole transition metal per hour comprising the step of providing at least one catalyst system comprising the reaction product of:
- (a) an activator; and
- (b) a catalyst precursor with the following formula:

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wherein

- (i)  $M$  is iron, nickel, cobalt, and palladium, platinum, ruthenium, osmium, rhodium, and iridium;
- (ii)  $N$  is nitrogen;
- (iii)  $P$  is phosphorus;
- (iv)  $R^1$ ,  $R^2$ ,  $R^3$ , and  $R^4$  are independently selected from methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, ethenyl, propenyl, butenyl, pentenyl, hexenyl, heptenyl, octenyl, nonenyl, decenyl, undecenyl, dodecenyl, ethynyl, propynyl, butynyl, pentynyl, hexynyl, heptynyl, octynyl, nonynyl, decynyl, undecynyl, dodecynyl, phenyl, benzyl, phenethyl, tolyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclononyl, cyclodecyl, cyclododecyl radicals;
- (v)  $Y$  is selected from butylene, pentylene, hexylene, heptylene, octylene, nonylene, decylene, undecylene, dodecylene, tridecylene, tetradecylene, pentadecylene, hexadecylene, heptadecylene, octadecylene, nonadecylene, eicosylene, heneicosylene,

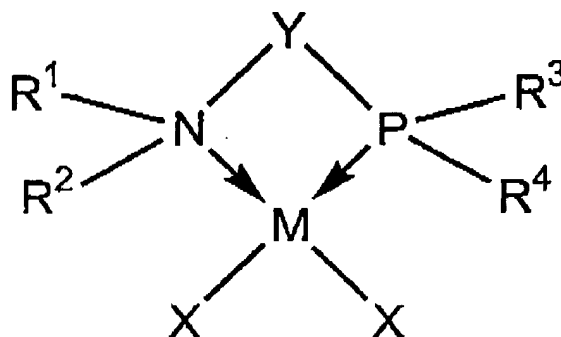
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docosylene, tricosylene, tetracosylene, pentacosylene, hexacosylene, heptacosylene, octacosylene, nonacosylene, triacontylene, cyclohexylene, cyclooctylene, cyclodecylene, cyclododecylene, biphenyl, butenylene, penentylene, hexenylene, heptenylene, octenylene, nonenylene, decenylene, undecenylene, dodecenylene, hexynylene, heptynylene, octynylene, nonynylene, decynylene, undecynylene, dodecynylene, butadienylene, pentadienylene, hexadienylene, heptadienylene, octadienylene, nonadienylene, decadienylene, undecadienylene, dodecadienylene, hexatrienylene, octatrienylene, decatrienylene, and dodecatrienylene radicals; and

- (vi) X are independently chloride, bromide, iodide, methoxide, ethoxide, dimethylamide, diethylethoxide, phenoxide, methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, hydride, phenyl, benzyl, phenethyl, tolyl, methoxy, ethoxy, propoxy, butoxy, dimethylamino, diethylamino, methylethylamino, acetylacetonate, 1,1, 1,5,5,5-hexafluoroacetylacetonate, 1,1, 1-trifluoro-acetylacetonate, or 1,1, 1-trifluoro-5,5-di-methylacetylacetonate radicals; or two X's are connected to form a 3-to-40-atom metallacycle ring.

35. (withdrawn) A polymerization method wherein the catalysts activity exceeds 8000 moles of ethylene per mole transition metal per hour comprising the step of providing at least one catalyst system comprising the reaction product of:
- (a) an activator; and
  - (b) a catalyst precursor with the following formula:

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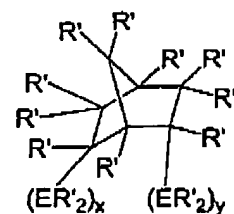
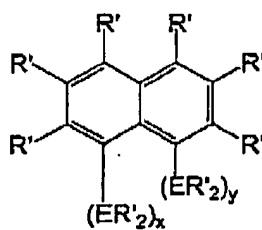
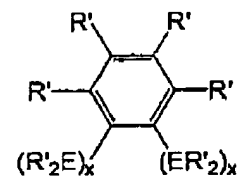
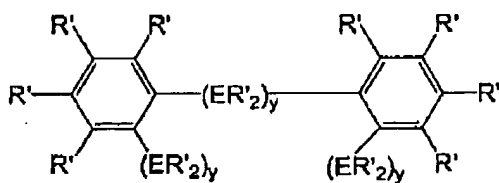
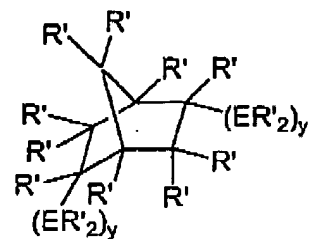
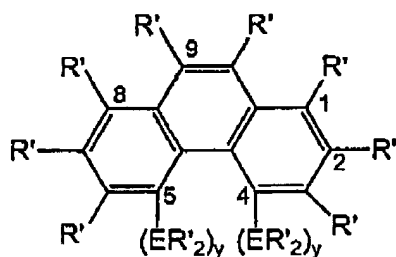


wherein

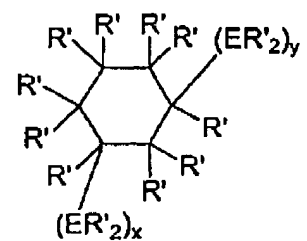
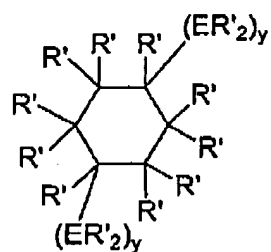
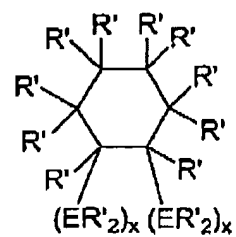
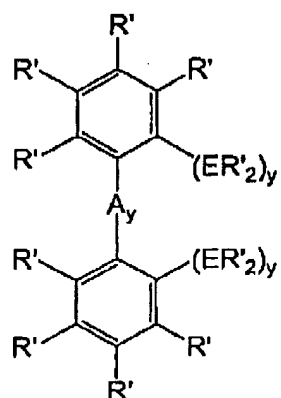
- (i) M is a Group-8, -9, or -10 transition metal;
- (ii) N is nitrogen;
- (iii) P is phosphorus;
- (iv) R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, and R<sup>4</sup> are independently hydrocarbyl radicals;
- (v) Y is represented by one of the following formulas:



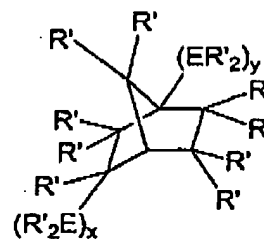
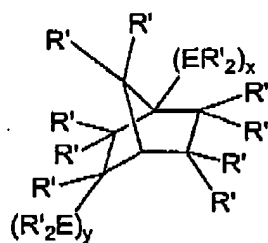
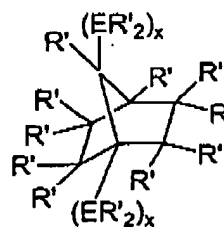
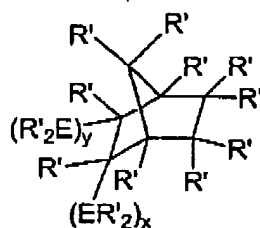
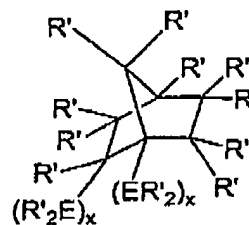
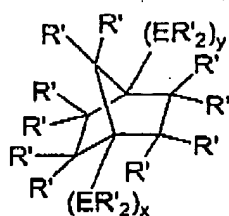
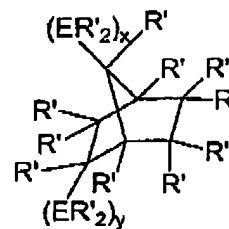
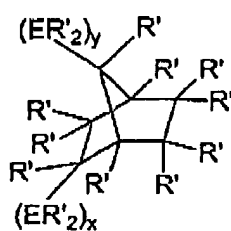
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where

- $R'$  are independently, hydrogen or  $C_1$ - $C_{50}$  hydrocarbyl radicals;
- $A$  is a non-hydrocarbon atom functional group;
- $E$  is a Group-14 element;

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- x is an integer from 1 to 4; and
  - y is an integer from 0 to 4.
- (vi) X are independently chloride, bromide, iodide, methoxide, ethoxide, dimethylamide, diethylethoxide, phenoxide, methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, triacontyl, hydride, phenyl, benzyl, phenethyl, tolyl, methoxy, ethoxy, propoxy, butoxy, dimethylamino, diethylamino, methylethylamino, acetylacetonate, 1,1, 1,5,5,5-hexa-fluoroacetylacetonate, 1,1, 1-trifluoro-acetylacetonate, or 1,1,1-trifluoro-5,5-di-methylacetylacetonate radicals; or two X's are connected to form a 3-to-40-atom metallacycle ring.
36. (New) The catalyst system of Claim 1, wherein the activator comprises a cyclic oligomeric aluminum compound represented by the formula  $(R''-Al-O)_n$ , or a linear oligomeric aluminum compound represented by the formula  $R''(R''-Al-O)_nAlR''_2$ , wherein  $R''$  is independently a  $C_1$ - $C_{20}$  alkyl radical, and wherein n is an integer from 1-50.
37. (New) The catalyst system of Claim 1, wherein the activator is methylalumoxane.
38. (New) The catalyst system of Claim 1, wherein the activator is triethylaluminum, diethylaluminum, chloride, triisobutylaluminum, tri-n-octylaluminum, or a combination thereof.
39. (New) The catalyst system of Claim 1, wherein the activator is

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[Me<sub>2</sub>PhNH][B(C<sub>6</sub>F<sub>5</sub>)<sub>4</sub>], [Bu<sub>3</sub>NH][BF<sub>4</sub>], [NH<sub>4</sub>][PF<sub>6</sub>], [NH<sub>4</sub>][SbF<sub>6</sub>], [NH<sub>4</sub>][AsF<sub>6</sub>], [NH<sub>4</sub>][B(C<sub>6</sub>H<sub>5</sub>)<sub>4</sub>], B(C<sub>6</sub>F<sub>5</sub>)<sub>3</sub>, B(C<sub>6</sub>H<sub>5</sub>)<sub>3</sub>, or a combination thereof.

40. (New) The catalyst system of Claim 1, wherein the catalyst is deposited on a solid support, the solid support comprising polymeric materials or refractory oxide materials.

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